REMARKS

I. Status f the Claims

Claims 1-19 are pending in the application. Claims 1-19 stand rejected. Claims 3, 8, 10, 11, 14, and 17-19 have been amended above. Applicants request entry of the foregoing amendments, reconsideration of the claim rejections and reexamination of the application.

II. 112 Rejections

Claims 8, 10, 11, 14, and 17-19 are rejected under § 112, second paragraph. Applicants respectfully traverse the rejection.

Claims 8, 10, 11, 14 and 17-19 have been amended to place the claims in more traditional format for examination in the U.S. Patent Office, and claim 8 has been amended to recite that "Materials ... are obtained by a process according to claim 1." Claims 8, 10, 11, 14 and 17-19 are believed now to fully meet the requirements of 35 U.S.C. § 112. Applicants respectfully request withdrawal of the rejection and allowance of the claims.

III. 101 Rejection

Claims 10, 11, 14, and 17-19 are rejected under § 101. Applicants respectfully traverse the rejection.

As noted above, claims 10, 11, 14 and 17-19 are amended above to place the claims in more traditional format for examination in the U.S. Patent Office. Claims 10, 11, 14 and 17-19 are believed now to fully meet the requirements of 35 U.S.C. § 101. Applicants respectfully request withdrawal of the rejection and allowance of the claims.

IV. Claim Objections

Claims 3 and 10 are objected to under rule 1.75(c). Applicants respectfully traverse the rejection.

The Examiner asserts that claim 3 is in improper dependent form for failing to further

limit the subject matter of a previous claim. Claim 3 depends from claim 1. Claim 1 recites, in part, a process "for the production of materials with interpenetrating organic and inorganic networks ... [by] mixing aqueous solutions or dispersions of organic polymers, polymer precursors or mixtures thereof which are capable of forming polymer networks in the aqueous phase with silicone dioxide compounds." Claim 3 recites that "sodium silicate, laminar silicates or silicic acids are used as the silicon dioxide compounds."

The Examiner has provided no clear reasoning or objective evidence sufficient to support a conclusion that the recital in claim 3 of "sodium silicate, laminar silicates or silicic acids" does not properly limit the recital in clam 1 of "silicon dioxide compounds." Further, while the Examiner suggests that the recital in claim 3 is improper because laminar silicates includes "metal oxides other than silicon oxide," this ignores the fact that claim 1 does not recite "silicon dioxide" but rather "silicon dioxide compounds." As made clear in the specification and claims of the application, "silicon dioxide compounds" (in some instances "silicon dioxide components") is a class of compounds broader than merely silicon dioxide. In fact, the specification (see, e.g., page 5) lists laminar silicates as being amongst the preferred silicon dioxide compounds. Accordingly, the objection to claim 3 is improper and should be withdrawn.

Claim 10 is amended above to depend from only a single claim. Accordingly, the rejection of claim 10 is overcome and should be withdrawn.

V. Claims 1, 3, 7, and 8 are Not anticipated by Harmer et al

Claims 1, 3, 7 and 8 are rejected under § 102(b) over Harmer et al (US 5,824,622). Applicants respectfully traverse the rejection.

Harmer et al. fails to anticipate claims 1, 3, 7, and 8, because Harmer et al. fails to disclose each and every element of any of claims 1, 3, 7 and 8. The Examiner asserts that Examples 2, 16 and 18 of Harmer et al anticipate claims 1, 3, 7 and 8. The examples referred to by the Examiner, however, fail to disclose each and every element of the claims. It is well established that to anticipate a claim a citation must disclose each and every element of the

claim.

The Examiner has provided no evidence to support the Examiner's assertion, that the process defined by claims 1, 3, 7 and 8 is inherent in Harmer et al. The test for inherent disclosure properly sets a high hurdle, with two separate and distinct requirements:

> "Such evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. See *Continental Can Co. U.S.A. v. Monsanto Co.*, 948 F.2d 1264, 1268, 20 USPQ2d 1746, 1749 (Fed. Cir. 1991).

Because no objective evidence has been provided to support the Examiner's inherency assertion, no prima facie rejection has been properly established by the Examiner.

Consider, especially, the recital in the present claims of the invention's "interpenetrating organic and inorganic networks." The specification refers repeatedly to this multiple network aspect of the invention:

> "By appropriate adjustment of the pH, the silicate network (silica gel) can be induced to form before the organic network is formed." (Page 10, lines 5-6.)
>
> "The time it takes for the gel to form and for the two networks to develop can be controlled ..." (Page 10, lines 8-9.)
>
> "The organic and inorganic (silicate) networks interpenetrate ..." (Page 11, line 9.)
>
> "If we assume a model of interpenetrating tubes, then this number gives the maximum diameter of the tubes in each network." (Page 11, lines 16-18.)
>
> "Because the networks rest against each other ..." (Page 11, line 18.)
>
> "After a gel of interpenetrating organic and silica gel networks has been formed, the gel is dried." (Page 11, last line to page 12,

line 1.)

In contrast, the description in Harmer et al of its "microcomposites" is in terms of only one network, a metal oxide network, not interpenetrating organic and inorganic networks as required by the present claims. Harmer et al states this quite clearly:

> It is believed that the highly porous structure of the microcomposites of the present invention consists of a continuous metal oxide phase which entraps a highly dispersed PFIEP within and throughout a connected network of porous channels. (Col. 7, lines 31-35.)

In view of Harmer et al's own description of its microcomposites in terms of having only a metal oxide network, there can be no evidence to support an inherency rejection, i.e., (i) there can be no evidence that the required interpenetrating networks of the present invention are necessarily present in the single network microcomposites of Harmer et al and (ii) it follows that there can be no evidence that those skilled in the art could recognize interpenetrating organic and inorganic networks would necessarily be present in the single network microcomposites of Harmer et al.

With reference to claim 1, Harmer et al. fails to disclose a process for production of materials with interpenetrating organic and inorganic networks on a scale of no more than 100 nm by (1) mixing aqueous solutions or dispersion of organic polymers, polymer precursors, or mixtures thereof which are capable of forming polymer networks in the aqueous phase with silicon dioxide compounds; (2) changing the pH of and/or thermally treating the aqueous solution or dispersion to form a gel consisting of interpenetrating organic and silica gel networks; and (3) drying the gel.

Claims 3, 7, and 8, each of which depend directly from claim 1, are patentable for the same reasons.

Accordingly, applicants request withdrawal of the rejection and allowance of the claims.

VI. Claims 5, 9 and 10 are Patentable over Harmer et al in view of Jansen et al

Claims 5, 9, and 10 are rejected under § 103 over Harmer et al in view of Jansen et al (US 5,795,556). Applicants respectfully traverse the rejection.

Each of claims 5, 9 and 10 depends, directly or indirectly, from claim 1 and is patentable over Harmer et al in view of Jansen et al for the reasons discussed above. More specifically, Jansen et al does not cure the "single network" deficiency of Harmer et al. There is no teaching or suggestion in Jansen et al for production of materials with interpenetrating organic and inorganic networks. Thus, Claims 5, 9 and 10 are patentable over Harmer et al in view of Jansen et al because Harmer et al fails to teach or suggest all the elements of claims 5, 9, and 10, and Jansen et al fails to cure the deficiencies of Harmer et al.

Moreover, there is no suggestion or motivation to combine Jansen et al with Harmer et al. Further, the Examiner has provided no evidence of any reasonable expectation of success if Harmer et al and Jansen et al were combined. Each of these requirements must be shown to establish a *prima facie* case of obviousness. More specifically, the Examiner has provided no objective evidence to support the combination of Harmer et al and Jansen et al. The Examiner asserts that it would have been obvious to use the process of Jansen et al to form the gel of Harmer et al, but fails to provide any evidence that one skilled in the art would be motivated to combine Jansen et al and Harmer et al. In the absence of motivation in the citations themselves to suggest the desirability of combining those citations, or to motivate one skilled in the art to make such combination, a *prima facie* case of obviousness is not established. Accordingly, claims 5, 9 and 10 are patentable over Harmer et al in view of Jansen et al.

With reference to claim 5, which depends from claim 1, Harmer et al fails to teach or suggest all elements of claim 5 and Jansen et al fails to cure the deficiencies of Harmer et al. That is, Harmer et al fails to teach or suggest a process for production of materials with interpenetrating organic and inorganic networks on a scale of no more than 100 nm by (1)

mixing aqueous solutions or dispersion of organic polymers, polymer precursors, or mixtures thereof which are capable of forming polymer networks in the aqueous phase with silicon dioxide compounds; (2) changing the pH of and/or thermally treating the aqueous solution or dispersion to form a gel consisting of interpenetrating organic and silica gel networks; and (3) drying the gel, wherein the water in the materials is replaced by an organic solvent before drying, and in that the silica gels are modified organically by silylation. Jansen et al fails to cure the deficiencies of Harmer et al. Further, the Examiner has provided no objective evidence to support the assertion that the process defined by claim 5 is inherent in Harmer et al or in Jansen et al. Therefore, claim 5 is patentable over Harmer et al in view of Jansen et al.

With reference to claim 9, Harmer et al fails to teach or suggest an aerogel consisting of organic and inorganic networks interpenetrating on a scale of no more than 100 nm with a density of no more than 0.6 g/cm^3. Jansen et al fails to cure the deficiencies of Harmer et al. In particular, there is no express or inherent disclosure whatsoever of the subject matter of claim 9 in Jansen et al or in Harmer et al. Accordingly, Harmer et al fails to teach or suggest the subject matter of claim 9, Jansen et al fails to cure the deficiencies of Harmer et al, and therefore claim 9 is patentable over Harmer et al in view of Jansen et al.

With reference to claim 10, which depends from claim 7 (claim 7 depends from claim 1), Harmer et al fails to teach or suggest the use of aerogels which are obtained according to a process for production of materials with interpenetrating organic and inorganic networks on a scale of no more than 100 nm by (1) mixing aqueous solutions or dispersion of organic polymers, polymer precursors, or mixtures thereof which are capable of forming polymer networks in the aqueous phase with silicon dioxide compounds; (2) changing the pH of and/or thermally treating the aqueous solution or dispersion to form a gel consisting of interpenetrating organic and silica gel networks; and (3) drying the gel, wherein the drying is conducted under conditions which lead to a xerogel or to an aerogel. Jansen et al fails to cure the deficiencies of Harmer et al. Accordingly, Harmer et al fails to teach or suggest the subject matter of claim 10, Jansen et al fails to cure the deficiencies of Harmer et al, and

therefore claim 10 is patentable over Harmer et al in view of Jansen et al.

Because the Examiner has failed to meet the requirements necessary to establish a *prima facie* cause of obviousness, claims 5, 9 and 10 are seen to be patentable over Harmer et al in view of Jansen et al. Applicants request withdrawal of the rejection and allowance of the claims.

VII. Claims 4, 6, 11-19 are Patentable over Harmer et al in view of Jansen et al and Geiss et al

Claims 4, 6, and 11-19 are rejected under § 103 over Harmer et al in view of Jansen et al and Geiss et al (US 5,948,314). Applicants respectfully traverse the rejection.

Each of claims 4, 6 and 11-19 depends, directly or indirectly, from claim 1 and is patentable over Harmer et al in view of Jansen et al and Geiss et al for the reasons discussed above. More specifically, neither Jansen et al nor Geiss et al cures the "single network" deficiency of Harmer et al. There is no teaching or suggestion in either Jansen et al or in Geiss et al, considered alone or in combination, for production of materials with interpenetrating organic and inorganic networks. Thus, Claims 4, 6, and 11-19 are patentable over the Harmer et al combined with any or all of the secondary citations because Harmer et al fails to teach or suggest all the elements of claims 4, 6, and 11-19, and the secondary citations fail to cure the deficiencies of Harmer et al. Accordingly, a *prima facie* case of obviousness has not been established.

Moreover, there is no suggestion or motivation to combine Harmer et al with Jansen et al and/or Geiss et al. Nor has the Examiner identified any basis supporting an expectation of success if Harmer et al and Jansen et al and/or Geiss et al were combined. The Examiner asserts that it would have been obvious to utilize various types of fillers in the composition of Harmer et al in view of Jansen et al. The Examiner further asserts that the filler of Geiss et al could be used. The Examiner has failed, however, to provide evidentiary support that one skilled in the art would recognize the desirability of combining Geiss et al or Jansen et al with Harmer et al. In the absence of suitable evidence to suggest the desirability of such

combination or to motivate one skilled in the art to make such combination, a *prima facie* case of obviousness is not established.

With reference to claim 4, which depends from claim 1, neither Jansen et al nor Geiss et al cures the deficiencies of Harmer et al. There is no teaching or suggestion in either Jansen et al or in Geiss et al, considered alone or in combination, for production of materials with interpenetrating organic and inorganic networks on a scale of no more than 100 nm by (1) mixing aqueous solutions or dispersion of organic polymers, polymer precursors, or mixtures thereof which are capable of forming polymer networks in the aqueous phase with silicon dioxide compounds; (2) changing the pH of and/or thermally treating the aqueous solution or dispersion to form a gel consisting of interpenetrating organic and silica gel networks; and (3) drying the gel, wherein the water in the materials is replaced by an organic solvent before drying, characterized in that fillers in the form of particles, fibers, fabrics, nonwovens, mats, or mixtures thereof or functional substances such as dyes, indicators, biomolecules, receptors or mixtures thereof are added to the aqueous solution. Accordingly, Harmer et al either alone or in combination with Jansen et al and/or Geiss et al fails to teach or suggest the subject matter of claim 4 and therefore claim 4 is patentable over Harmer et al in view of Jansen et al and/or Geiss et al.

With reference to claim 6, which depends from claim 1, neither Jansen et al nor Geiss et al cure the deficiencies of Harmer et al. There is no teaching or suggestion in Jansen et al or in Geiss et al for production of materials with interpenetrating organic and inorganic networks on a scale of no more than 100 nm by (1) mixing aqueous solutions or dispersion of organic polymers, polymer precursors, or mixtures thereof which are capable of forming polymer networks in the aqueous phase with silicon dioxide compounds; (2) changing the pH of and/or thermally treating the aqueous solution or dispersion to form a gel consisting of interpenetrating organic and silica gel networks; and (3) drying the gel, characterized in that drying is conducted under condition which lead to a composite material, where the composite material can then be calcined. In particular, there is no disclosure in Jansen et al or in Geiss et al of a composite material (produced in accordance with claim 6) which can be calcined,

and the Examiner has provided no objective evidence of any inherent disclosure of a composite material which can be calcined in Jansen et al or in Geiss et al. Accordingly, Harmer et al either alone or in combination with Jansen et al and/or Geiss et al fails to teach or suggest all the elements of claim 6 and, therefore, claim 6 is patentable over Harmer et al in view of Jansen et al and/or Geiss et al.

Claim 11, which depends from claim 6, is patentable for the reasons stated above in regard to claim 6.

Claims 12, 13, and 15-19 depend directly or indirectly from claim 9. Because Harmer et al in view of Jansen et al and/or Geiss et al fails to teach all the elements of claim 9, claims 9, 12, 13, and 15-19 are patentable over Harmer et al in view of Jansen et al and/or Geiss et al. More specifically, with reference to claim 9, Harmer et al fails to teach or suggest an aerogel consisting of organic and inorganic networks interpenetrating on a scale of no more than 100 nm with a density of no more than 0.6 g/cm^3. Jansen et al and/or Geiss et al fail to cure the deficiencies of Harmer et al. Nor is there disclosure of such inventive subject matter in Jansen et al or in Geiss et al. Furthermore, the Examiner has not provided any objective evidence to establish that the subject matter of any of claims 9, 12, 13, and/or 15-19 is inherent in Harmer et al, Jansen et al or Geiss et al. Accordingly, claims 9, 12, 13, and 15-19 each is patentable over Harmer et al in view of Jansen et al and/or Geiss et al.

Harmer et al fails to teach or suggest all the elements of claim 14. In particular, Harmer et al fails to teach or suggest a process for production of materials with interpenetrating organic and inorganic networks on a scale of no more than 100 nm by (1) mixing aqueous solutions or dispersion of organic polymers, polymer precursors, or mixtures thereof which are capable of forming polymer networks in the aqueous phase with silicon dioxide compounds; (2) changing the pH of and/or thermally treating the aqueous solution or dispersion to form a gel consisting of interpenetrating organic and silica gel networks; and (3) drying the gel, in which the materials are used in conjunction with dyes, indicators, receptors, enzymes, and/or biomolecules for medical diagnostics and sensor technology. Jansen et al and Geiss et al fail to cure the deficiencies of Harmer et al and, therefore, claim

14 is patentable over Harmer et al in view of Jansen et al and/or Geiss et al.

Because Harmer et al fails to teach or suggest each and every element of claims 4, 6, and 11-19, and because Jansen et al and/or Geiss et al fail to cure the deficiencies of Harmer et al, claims 4, 6 and 11-19 are patentable over Harmer et al in view of Jansen et al and/or Geiss et al. Applicants respectfully request withdrawal of the rejection and allowance of the claims.

VIII. Claim 2 is Patentable over Harmer et al in view of Pekala

Claim 2 is rejected under § 103 over Harmer et al in view of Pekala. Applicants respectfully traverse the rejection.

Harmer et al fails to teach or suggest all the elements of claim 2, and Pekala fails to cure the deficiencies of Harmer et al. More specifically, Pekala does not cure the "single network" deficiency of Harmer et al. There is no teaching or suggestion in Pekala for production of materials with interpenetrating organic and inorganic networks.

Moreover, there is no suggestion or motivation to combine Harmer et al with Pekala. In particular, the Examiner has not provided any objective evidence to support the assertion that it would have been obvious to use melamine-formaldehyde polymer of Pekala in place of the fluorinated polymer of Harmer et al. The Examiner also has failed to provide any objective evidence that one skilled in the art would be motivated to combine Pekala with Harmer et al. Furthermore, the Examiner has provided no evidence of any reasonable expectation of success if Harmer et al and Pekala were combined. Accordingly, the Examiner has failed to establish a *prima facie* case of obviousness of claim 2.

In the absence of suitable evidence to suggest or to motivate one skilled in the art the desirability of combining citations, a *prima facie* case of obviousness is not established.

Harmer et al fails to teach or suggest a process for the production of materials with interpenetrating organic and inorganic networks on a scale of no more than 100 nm by (1) mixing aqueous solutions or dispersion of organic polymers, polymer precursors, or mixtures thereof which are capable of forming polymer networks in the aqueous phase with silicon

dioxide compounds; (2) changing the pH of and/or thermally treating the aqueous solution or dispersion to form a gel consisting of interpenetrating organic and silica gel networks; and (3) drying the gel, characterized in that the organic polymers or their precursors are based on formaldehyde or formaldehyde containing resins, polyvinyl alcohol, or poly(meth)acrylate. Pekala fails to cure the deficiencies of Harmer et al. In particular, there is no teaching or suggestion in either citation of a process for the production of materials with interpenetrating organic and inorganic networks on a scale of no more than 100 nm.

Accordingly, claim 2 is patentable and non-obvious over Harmer et al in view of Pekala. Applicants request withdrawal of the rejection and allowance of the claims.

IX. Claim 2 is Patentable over Harmer et al in view of Mager et al

Claim 2 is rejected under § 103 over Harmer et al in view of Mager et al. Applicants respectfully traverse the rejection.

Harmer et al fails to teach or suggest all the elements of claim 2, and Mager fails to cure the deficiencies of Harmer et al. More specifically, Mager does not cure the "single network" deficiency of Harmer et al. There is no teaching or suggestion in Mager for production of materials with interpenetrating organic and inorganic networks.

Moreover, there is no suggestion or motivation to combine Harmer et al with Mager. In particular, the Examiner has not provided any objective evidence to support the assertion that it would have been obvious to one having ordinary skill in the art at the time of the instant invention to use the polymers of Mager et al with the silica gels of Harmer et al. The Examiner also has failed to provide any objective evidence that one skilled in the art would be motivated to combine Mager et al with Harmer et al. Furthermore, the Examiner has provided no evidence of any reasonable expectation of success if Harmer et al and Mager et al were combined. Accordingly, the Examiner has failed to establish a *prima facie* case of obviousness of claim 2.

Harmer et al, either alone or in combination with Mager et al, fails to teach or suggest

a process for the production of materials with interpenetrating organic and inorganic networks on a scale of no more than 100 nm by (1) mixing aqueous solutions or dispersion of organic polymers, polymer precursors, or mixtures thereof which are capable of forming polymer networks in the aqueous phase with silicon dioxide compounds; (2) changing the pH of and/or thermally treating the aqueous solution or dispersion to form a gel consisting of interpenetrating organic and silica gel networks; and (3) drying the gel, characterized in that the organic polymers or their precursors are based on formaldehyde or formaldehyde containing resins, polyvinyl alcohol, or poly(meth)acrylate. Accordingly, claim 2 is patentable and non-obvious over Harmer et al in view of Mager et al, and applicants request withdrawal of the rejection and allowance of claim 2.

X. Conclusion

Claims 1-19 are patentable over the citations for the reasons stated above. Applicants request withdrawal of the rejection and allowance of the claims.

Respectfully submitted
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Title: **NANOPOROUS INTERPENETRATING ORGANIC-INORGANIC NETWORKS**

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VERSION SHOWING CHANGES MADE

Claim 3. (Twice Amended) The ~~P~~process according to Claim 1, characterized in that sodium silicate, laminar silicates or silicic acids are used as the silicon dioxide ~~component~~compounds.

Claim 8. (Twice Amended) Materials with organic and inorganic networks which interpenetrate on a scale of no more than 100 nm and are ~~obtainable~~obtained by a process according to Claim 1.

Claim 10. (Amended) Use of aerogels ~~according to Claim 9 which are obtained according to the process of Claim 7, for the production of~~ comprising producing molded articles or surface coatings with thermal insulation properties, sound absorption properties, ~~and/or~~ adsorption properties, and/or barrier properties against~~versus~~ water and/or organic solvents, using ~~the~~ aerogels obtained according to the process of Claim 7.

Claim 11. (Amended) Use of composite materials, ~~obtainable according to the process of Claim 6 for the production of~~ comprising producing granulates or molded ceramic articles using composite materials obtained according to the process of Claim 6.

Claim 14. (Twice Amended) Use of materials ~~such as those defined in claim 8~~ comprising using materials of claim 8 in conjunction with dyes, indicators, receptors, enzymes, and/or biomolecules for medical diagnostics and sensor technology.

Claim 17. (Amended) Use of materials ~~such as those defined by claim 9~~ comprising using materials of claim 9 in conjunction with dyes, indicators, receptors, enzymes, and/or biomolecules for medical diagnostics and sensor technology.

Claim 18. (Amended) Use of a molded article or surface coatings ~~such as those defined in claim 12~~ comprising using a molded article or surface coating of claim 12 in conjunction with dyes, indicators, receptors, enzymes, and/or biomolecules for medical diagnostics and sensor technology.

Claim 19. (Amended) Use of a molded article or surface coatings ~~such as those defined by claim 15~~ comprising using a molded article or surface coating of claim 15 in conjunction with dyes, indicators, receptors, enzymes or biomolecules for medical diagnostics and sensor technology.